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Patel, Kishan

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Distinctive role of income in the all-cause mortality among working age migrants and the settled population in Finland: a follow-up study from 2001 to 2014

Kishan Patel{1}, Anne Kouvonen{1,2,3}, Aki Koskinen{5}, Lauri Kokkinen{5}, Michael Donnelly{1,4}, Dermot O'Reilly{1,4} and Ari Väänänen{5,6}

{1}Administrative Data Research Centre - Northern Ireland, Centre for Public Health, Queen's University Belfast, Belfast, UK

{2}Faculty of Social Sciences, University of Helsinki, Helsinki, Finland

{3}SWPS University of Social Sciences and Humanities in Wroclaw, Wroclaw, Poland

{4}UKCRC Centre of Excellence for Public Health (Northern Ireland), Queen's University Belfast, Belfast, UK

{5}Finnish Institute of Occupational Health, Helsinki, Finland

{6}School of Social Policy, Sociology and Social Research, University of Kent, UK

Kishan Patel

Centre for Public Health, Queen's University Belfast, Belfast, UK

kpatel05@qub.ac.uk

Abstract

Background

Although income level may play a significant role in mortality among migrants, previous research has not focused on the relationship between income, migration and mortality risk. The aim of this register study was to compare all-cause mortality by income level between different migrant groups and the majority settled population of Finland.

Methods

A random sample of 1,058,391 working age people (age range 18 to 64 years; 50.4% male) living in Finland in 2000 were drawn, and linked to mortality data from 2001 to 2014. Data were obtained from Statistics Finland. Cox proportional hazard models were used to investigate the association between region of origin and all-cause mortality in low and high income groups.

Results

The risk for all-cause mortality was significantly lower among migrants than among the settled majority population (HR 0.57 (95% 0.53-0.62)). After adjustment for age, sex, marital status, employment status and personal income, the risk of mortality was significantly reduced for low-income migrants when compared to the settled majority population with low-income level (HR 0.46 (95% CI 0.42 - 0.50)), and for high income migrants when compared to the high-income settled majority (HR 0.81(95% CI 0.69-0.95). Results comparing individual high-income migrant groups and the settled population were not significant. Low-income migrants from Africa, the Middle East and Asia had the lowest mortality risk of any migrant group studied (HR 0.32(95% CI 0.27-0.39)).

Conclusion

Particularly low-income migrants seem to display a survival advantage when compared to the corresponding income group in the settled majority. Downward social mobility, differences in health-related lifestyles, and the healthy migrant effect may explain this phenomenon.

keywords: migrants, all-cause mortality, register data, record-linkage, socioeconomic status, income

Introduction

The rate of worldwide migration has increased dramatically in recent years; in 2015 more than 244 million people were living in countries that they were not born in, an increase of over 70 million since 2000[1]. Although the rise in the rate of migration has led to concerns with regard to the pressure placed on health services to accommodate larger populations [2], the “healthy migrant effect” has been found in previous studies [3, 4, 5]. It describes the phenomenon wherein those who migrate tend to be healthier on average than those in both their native and new countries, though this effect greatly depreciates over time [6, 7].

However, migrants are not a homogenous group, and differing health effects can be expected between groups, a contributor to the mixed results yielded by earlier research on migrant mortality. A study conducted in Sweden found that both refugees and economic migrants had significantly lower mortality rates when compared to the settled majority population [3]. Similarly, a recent Italian study found lower mortality rate ratios for migrants [4]. Yet, some studies have found that migrants have higher mortality rates than settled majority populations [8, 9]. A 2005 study by Albin and colleagues found that migrants, and especially those from other Nordic countries, had higher mortality rates compared to the settled Swedish population [10]; similar results have been reported earlier [11]. Other research pooling six European populations and examining the discrepancy between migrant and majority population mortality showed a reduction in risk for both men and women from East Asia and Latin America, but an increase in risk for those from North Africa and Eastern Europe [8].

One variable which may influence the variation in mortality risk for different migrant groups is socio-economic status, and specifically, income. A study of foreign-born Mexicans in the US found that whilst this migrant group tended to have lower socio-economic status when compared to the

US-born population, they also had decreased mortality rates [12]. An investigation into migrant country of birth found that those migrating from the poorest countries to Spain experienced the poorest socio-economic situations, but also had the better health, relative to those from richer countries [13].

Finland is a country that has experienced a particularly large increase in migrant population in recent years. At the beginning of 2015, almost 6% of the population were migrants [14]; a 100% increase since 2000. Of all migrants into Finland in 2014, 64% were non-European Union citizens [15]. Within this group of non-EU migrants, 39% were granted residence on the basis of family ties by the Finnish Immigration Service, making it the most popular reason for migration. The second most popular reason for positive residence permit decisions in 2014 was education (25%), followed by employment (22%), and remigration (1%). A small proportion of non-EU migrants were asylum seekers (6%). The reason for granted residence status was not available for EU-citizens.

Much research into migrant mortality has been conducted in other Nordic countries, with varying results [3, 10, 16, 17]. Using a three-year follow-up Lehti et al. recently observed that migrants have a significantly lower mortality risk than the settled Finnish population [18]. Previous studies suggest that migrants may differ from the settled population depending on their income level, and this difference could lead to a discrepancy in survival advantage [19, 20].
However, although the income level may play a significant role in mortality, to our best knowledge no previous study has looked specifically at the relationship between income, migration and mortality risk.

The aim of this 14-year register follow-up study was to investigate the association of the region of origin and income with all-cause mortality of working-age migrants living in Finland, compared to the majority settled population of a similar age.

Methods

Data and study population

The study population was drawn from a population database maintained by Statistics Finland, which has been evaluated as a high quality database, reaching up to 98.9% accuracy rates for certain variables [21]. The cohort consisted of a random sample of 33% of all working-age residents (age range 18-64) of Finland in the year 2000 (1,058,391 residents of Finland, of which 20,295 were migrants). Subjects were classified as migrants if they were born outside of Finland.

We formed five different regions of birth: Finland; Russia or USSR; Eastern Europe and the Balkans; Western Europe and other Western countries; and Africa, Middle East and Asia. Due to low case numbers in some groups (e.g. high-income female migrants in most migrant groups), we did not stratify by sex but analysed women and men together. Moreover, the sex * migrant group interaction was tested and it was not significant (p=0.90). Age, sex, marital status (single/married/divorced/widowed) and employment status (higher non-manual employees/lower non-manual employees/self-employed/manual workers/not in work/students) were also drawn from the Finnish Employment Statistics kept by Statistics Finland. In order to analyse the relationship between income and mortality, we assigned each person to one of two income classes, ‘high’ or ‘low’ income, calculated from the median income (from work and benefits) for the entire cohort in 2001.

Mortality data from January 1, 2001, to December 31, 2014 were obtained from the National Death Register kept by Statistics Finland; a virtually complete register with only 0.5% of all deaths in 2013 missing from the database [22]. Date of death (obtained from death certificates), and as such,

survival time, was used in our analysis. Records from the population database were linked by unique, personal ID numbers to the National Death Register.

Statistical analyses

Descriptive analyses were conducted in order to provide an overview of the demographic and socio-economic characteristics of our cohort.. Using the settled majority Finnish population as a reference group, we produced proportional hazard ratios (HRs) and 95% confidence intervals (95% CIs) for all-cause mortality for all migrants, and then for each individual region of origin. We compared mortality risks between migrant groups and the settled majority using four Cox proportional hazards models: first adjusted for age and sex, then adjusted for age, sex and marital status, and then a fully adjusted model additionally including employment status and personal income. The analysis was then repeated, stratifying by low and high income, using a median split to examine the relationship between mortality risk, income, and migrant status. Tests of cumulative sums of martingale residuals against follow-up times were conducted, and no test violated the proportional hazards assumption.

The analyses were performed using the SAS 9.4 software (SAS Institute, Cary, NC, USA) PHREG procedure.

Results

Table 1 shows the demographic and socio-economic characteristics of our cohort. It shows that 98.1% of our cohort comprised of the settled majority population; the remaining 1.9% was made up of the migrant population.

Our cohort consisted of 20,295 migrants and 1,038,096 Finnish-born subjects. The proportion of men in the migrant population (51.2%) was slightly higher than the proportion of men in the settled Finnish population (50.0%) This difference was exacerbated in the gender split of migrants from Western Europe and other western countries, and Africa, the Middle East and Asia, which were heavily weighted towards males, whilst females comprised the majority in migrants with Russian origin. Only the Eastern European group had numbers close to an equal gender split.

The proportion of 18-24 years olds in the migrant population was equal to that of the settled Finnish majority population. The proportion of older people (55-64) was much lower in the migrant population. Migrants from Africa, the Middle East and Asia were the youngest, with 74.6% of the population under the age of 40, and only 3.0% over 55.

For all migrant groups other than the Western Europe and other western countries group, Finnish-born subjects were more likely to be single, and less likely to be married. Comparing each migrant group revealed similar proportions, but again, Western migrants were the anomaly.

The settled Finnish population were more likely to hold lower non-manual jobs, and less likely to be students or out of work than migrants were. All other status variables yield similar proportions between the two groups. Not in work prevalence was considerably high (32.9%-39.1%) for all migrant groups apart from migrants from western countries. The latter group also contained a proportion of higher non-manual employees at least twice as high as any other group, likely because migrants from high-income countries typically move to Finland to study (though the proportion of students from this region is small), as expats, or due to having a high-quality job offer. In addition, migrants from Russia and Africa, the Middle East and Asia were much less likely to be higher non-manual employees than any other groups.

We identified 636 deaths among migrants and 70,373 deaths among the settled Finnish population during the 14-year follow-up. Table 2 shows the mortality hazard ratios for migrants when compared to the settled population. After adjustment for age, sex and marital status, our 'all-migrants' cohort had a 26% smaller risk of mortality than the settled population. Additionally, the survival advantage of migrants was more pronounced when adjusting for employment status and personal income (HR 0.57 95% CI 0.53-0.62). Most individual groups of migrants followed this same pattern. Migrants from Africa, Middle East and Asia experienced the lowest mortality risk across all models (HR 0.41 95% CI 0.35-0.48). The Russian migrant group experienced the largest drop in mortality risk after adjustment for employment status. The only group that experienced an increase in mortality risk after adjusting for employment status and personal income was the group from Western Europe and other western countries (HR 0.65 95% CI 0.56-0.76).

Table 3 splits the cohort into two groups around the median income of the cohort. When isolating low-income migrants and comparing them to low-income Finns, a similar pattern is displayed as with models for the whole population. A decrease in mortality risk was exhibited when adjusted for age, sex and marital status (HR 0.56 95% CI 0.51-0.61), and was even more robust after additional inclusion of employment status and continuous personal income into the model (HR 0.46 95% CI 0.42-0.50). All risks for all low-income migrant groups were lower than their respective total population counterparts.

For high-income migrants, after adjustment for age, sex, marital status, employment status and personal income, mortality risk was slightly decreased (HR 0.81; 95% CI 0.69-0.95), but the association became non-significant at individual migrant group levels.

Settled populations are in general older than migrant populations and this pattern is reflected in our cohort. In order to assess the influence that this difference in age had on our results, we ran a

sensitivity analysis. The results were very similar to the results in the total sample. the exclusion of those who were 55 years of age or older at baseline showed a slight, but not significant, decrease in the mortality risk of all groups. After adjustment for age, sex, marital status, employment status, and personal income. the HR for all migrants was0.50; (95% CI 0.45-0.55) (Supplementary File 1).

Discussion

Our results indicate that migrants in Finland have a lower risk of mortality than their settled majority counterparts. These results are concurrent with a number of earlier studies [3, 5, 18]; although conflicting results have also been found [8, 9] Our results further demonstrate that low-income migrants display a greater survival advantage compared to the low-income settled population, than their high-income counterparts compared to the high-income settled population.

The decreased mortality risk, particularly in low-income migrants, may be partially explained by downward social mobility. The limited job opportunities for migrants in a new country can lead to a slide down the employment status ladder. As such, our classifications may be too short-sighted to account for the health trajectory of certain individuals. That is to say the income and employment status of a migrant may not reflect said migrants' health. A migrant may still exhibit residual pre-migration health behaviors and risks, independent of their new employment status and income. It is therefore possible that such a pronounced decrease in mortality risk when adjusted for income and employment status is just an artefact of over-adjustment.

However, previous research has shown that social mobility does significantly affect health. A study of almost 50,000 men between 45 and 64 years of age found that individuals sliding down the employment status ladder have an increased mortality risk when compared to those they had left

behind in their former employment status [23]. This provides evidence to oppose the idea that we are over-adjusting when adjusting for employment status; it is possible that migration has a great enough effect on the health trajectory of a migrant to alter their mortality risk more than is expected.

Low-income migrants, when compared to the low-income settled population, had a lower mortality risk than high-income migrants when compared to the high-income settled population. This may be due to differences in health-related lifestyles of the two low-income groups. The low-income settled population may lead a poorer lifestyle, and can also be described as a 'selected' group; research has shown that there is little variation in health behaviors for men in the lowest employment statuses [24]. Perhaps the most well-known negative health behavior is high alcohol consumption, which is more prevalent amongst the Finnish-born population than it is amongst migrants, and was responsible for a larger proportion of deaths for Finns than for migrants between 2011-2013 [18]. On the other hand, low-income migrants tend to display more variation within lowest employment statuses, and can be described as 'resourceful', as they have managed to migrate to a new country [25].

Alternatively, the salmon bias, which explains that persons are more likely to return to their home countries during times of hardship such as illness, may play a part in the discrepancy. It is possible that particularly low-income migrants will seek healthcare outside of Finland towards the ends of their lives, and not have this emigration accounted for in Finnish registers. However, earlier studies have showed that remigration bias may not explain the difference in mortality [26,27].

The migrant group assessed as having the lowest risk of mortality was the group from Africa, the Middle East and Asia. The number one reason for migration in 2015 from China, Korea, Nepal and Vietnam was for education. The number two reason for the majority of these countries, and the top

reason for migration from India was employment [28]. Should this be representative of the other countries in Africa, the Middle East and Asia, these reasons may explain the relatively low mortality risk. The relatively higher mortality risk for Russians may now be lower than in the study cohort, due to a recent influx of specialized professionals such as doctors moving from Russia to Finland.

Strengths and Limitations

Information bias was minimised due to the high quality of our dataset, which covered an exceptionally large, representative sample of the Finnish working-age population. This led to high external validity; such a large sample size allowed us to generalize for entire populations with confidence. The possibility of type one errors were also greatly reduced. Furthermore, we were able to use a number of variables in our analysis due to the completeness of the data.

However, there were a few limitations with our study. An even larger dataset would have allowed us to analyse additional variables, such as cause of death, or to form more specific categories such as smaller groups for geographical regions of origin. We were also unable to distinguish between economic migrants, and those that were refugees or seeking asylum. This means our income-based data does not account for the often great difference in risk of mortality between these groups. Using personal income as a measure of income, as opposed to household income is also a limitation. Knowing that a large proportion of the cohort are married, it is safe to assume that not every individual's income is an accurate reflector of the amount of money the individual has at his or her disposal (e.g. an unemployed individual with a high-earning partner may have more money than an individual who is earning their own salary). We were also unable to empirically assess the amount that the salmon bias is responsible for differing migrant mortality rates. This could be tested through linking emigration and health service registers. Unfortunately, we had no way of estimating the number of people who had since emigrated away from Finland without informing the

authorities. This may also have resulted in an over-estimation of the total population, and a number of ‘immortal’ subjects.

Conclusion

We found that migrants have a lower risk of mortality than the settled Finnish population, and that this difference is more pronounced among those who earn a low income. This suggests that the healthy migrant effect and/or the salmon bias may play a part in the survival advantage of migrants. Future research could stratify results by migrant type (i.e. economic migrant, refugee or asylum seeker) to explore the effect that forced migration has on health. Cause of death should also be further investigated.

Endnotes:

Contributors

KP drafted the paper. AKou, AKos, LK, MD, DOR and AV contributed to designing the study, reviewing the article and revising it critically for important intellectual content. All authors read and approved the final version.

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Competing interests

None declared.

Patient consent

NA

Ethics approval

The Ethics Committee of the Finnish Institute of Occupational Health approved the study.

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Table 1: Characteristics of the cohort. Figures are percentages if not stated otherwise

	Settled majority population	All migrants	Migrants by region of origin			
			Russia	Eastern EU, Balkans	Western EU, Other Western	Africa, Middle East, Asia
Number of persons	1,038,096	20,295	6576	3473	4152	6094
	98.1	1.9	32.4	17.1	20.5	30.0
Sex						
Male	50.4	51.2	32.6	48.9	64.9	63.3
Female	49.6	48.8	67.4	51.1	35.1	36.7
Age						
18-24	13.8	13.8	12.8	15.4	13.4	14.3
25-39	31.3	50.0	41.5	51.3	47.4	60.3
40-54	37.3	30.1	38.3	28.7	29.6	22.5
55-64	17.6	6.0	7.4	4.6	9.5	3.0
Marital status						
Single	37.5	22.9	14.5	22.7	40.6	20.1
Married	49.1	62.5	68.2	65.1	48.7	64.4
Divorced	11.5	13.3	15.4	11.0	10.0	14.4
Widowed	1.9	1.3	1.9	1.1	0.6	1.2
Employment status						
Higher non-manual employees	12.9	12.8	9.2	12.2	27.0	7.4
Lower non-manual employees	23.5	13.1	12.6	13.4	20.1	8.9
Self-employed	7.6	5.3	3.1	3.8	7.9	6.6
Manual workers	25.1	23.6	22.6	26.5	20.9	25.0
Not in work	24.2	32.9	37.0	32.9	17.3	39.1
Students	6.7	12.3	15.5	11.2	6.9	13.0

Table 2. Mortality risk by region of origin for people aged 18-64: Hazard ratios (95% confidence intervals) from Cox proportional hazards models.

Region of origin	*N* Deaths	Model 1	Model 2	Model 3
Finland	70373	1.00	1.00	1.00
All migrants	636	0.67 (0.62-0.73)	0.74 (0.68-0.80)	0.57 (0.53-0.62)
Russia	245	0.81 (0.72-0.92)	0.93 (0.82-1.05)	0.63 (0.56-0.72)
Eastern EU, Balkans	112	0.75 (0.62-0.90)	0.86 (0.71-1.03)	0.65 (0.54-0.78)
Western EU, Other Western	143	0.59 (0.50-0.70)	0.60 (0.51-0.71)	0.65 (0.56-0.76)
Africa, Middle East, Asia	136	0.53 (0.46-0.64)	0.60 (0.51-0.71)	0.41 (0.35-0.48)

Model 1: Adjusted for age and sex

Model 2: Model 1 plus adjustment for marital status

Model 3: Model 2 plus further adjustment for employment status and personal income

Table 3. Mortality risk by country of origin for people aged 18-64, stratified by income: Data represent hazard ratios (95% confidence intervals) from Cox proportional hazards models.

Income Group	Country of birth	*N* Deaths	Model 1	Model 2	Model 3
Low Income	Finland	45466	1.00	1.00	1.00
	All migrants	486	0.49 (0.44-0.53)	0.56 (0.51-0.61)	0.46 (0.42-0.50)
	Russia	211	0.59 (0.52-0.68)	0.70 (0.61-0.80)	0.54 (0.47-0.62)
	Eastern EU, Balkans	91	0.59 (0.48-0.72)	0.70 (0.57-0.86)	0.57 (0.46-0.70)
	Western EU, Other Western	74	0.43 (0.34-0.54)	0.45 (0.36-0.57)	0.47 (0.37-0.59)
	Africa, Middle East, Asia	110	0.35 (0.29-0.42)	0.41 (0.34-0.49)	0.32 (0.27-0.39)
High Income	Finland	24905	1.00	1.00	1.00
	All migrants	150	0.76 (0.65-0.89)	0.78 (0.66-0.91)	0.81 (0.69-0.95)
	Russia	34	0.78 (0.56-1.09)	0.82 (0.59-1.15)	0.81 (0.58-1.13)
	Eastern EU, Balkans	21	0.65 (0.43-1.00)	0.69 (0.45-1.06)	0.70 (0.46-1.08)
	Western EU, Other Western	69	0.82 (0.65-1.04)	0.82 (0.65-1.04)	0.90 (0.71-1.15)
	Africa, Middle East, Asia	26	0.68 (0.47-1.00)	0.70 (0.58-1.03)	0.70 (0.48-1.03)

Model 1: Adjusted for age and sex

Model 2: Model 1 plus adjustment for marital status

Model 3: Model 2 plus further adjustment for employment status and personal income